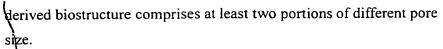


WHAT IS CLAIMED IS:

- 1. A composite biological device comprising a biostructure comprising at least one metabolically active biological material as an integral component thereof, wherein at least a portion of the biostructure comprises a nonporous latex-derived material.
- 2. The composite device of claim 1 wherein the biostructure comprises at least one layer comprising a porous latex-derived material and at least one layer comprising a nonporous latex-derived material.
- 3. The composite device of claim 1 wherein the nonporous material defines at least one channel or at least one well.
- 4. The composite device of claim 1 wherein the biostructure comprises no greater than about 75% by volume biological material.
- 5. The composite device of claim 4 wherein the biostructure comprises no greater than about 50% by volume biological material.
- 6. The composite device of claim 1 wherein the biological material comprises a procaryote, a eucaryote, an archean organism, or a combination thereof.
- 7. The composite device of claim 1 wherein the biological material comprises a mammalian cell, a blood cell, an avian cell, a plant cell, an insect cell, a bacteriophage, a spore, a virus, or a combination thereof.
- 8. The composite device of claim 1 wherein the biological material comprises a recombinant bacterial, yeast, or fungal cell.
- 9. The composite device of claim 8 wherein the recombinant cell is optimized for desiccation tolerance.
- 10. The composite device of claim 1 wherein the biostructure further comprises at least one additive selected from the group of a salt, a pigment, an adsorbent, a liquid crystal, a porosity modifier, a chelating agent, a nutrient, a surfactant, a dye, a photoreactive compound, an antibiotic, an antimicrobial, a bacteriostatic compound, an enzyme, an osmoprotectant, a biopolymer, a metal, a chemical catalyst, and a combination thereof.
- 11. The composite device of claim 1 wherein the biostructure further comprises a transmitter incorporated therein.



- 12. The composite device of claim 1 wherein the biostructure further comprises a detector incorporated therein.
- 13. The composite device of claim 12 wherein the detector senses a response emitted from the biological material when in contact with an analyte.
- 14. The composite device of claim 1 wherein the biostructure comprises a cross-linked latex-derived polymer.
- 15. The composite device of claim 1 wherein the biostructure is non-hydrated.
- 16. The composite device of claim 1 wherein the biostructure further comprises a porous latex-derived material.
- 17. The composite device of claim 16 wherein the porous latex-derived material comprises a mixture of latices.
- 18. The composite device of claim 1 further comprising a substrate on which the biostructure is disposed.
- 19. The composite device of claim 18 wherein the substrate comprises a membrane, a filament, or a wire.
- 20. The composite device of claim 18 wherein the substrate comprises a metal or a polymeric material.
- 21. The composite device of claim 18 wherein the substrate is an electronic device.
- 22. The composite device of claim wherein the biostructure comprises wires or electrodes.
- 23. The composite device-of claim 1 wherein the biostructure is no greater than about 500 microns thick.
- 24. The composite device of claim 1 wherein the entire device is no greater than about 500 microns thick.
- 25. A composite biological device comprising a 3-dimensional porous latex-derived biostructure comprising at least one metabolically active biological material incorporated therein; wherein the biostructure is disposed on a porous substrate.
- 26. A composite biological device comprising a 3-dimensional porous latex-derived biostructure comprising at least one metabolically active biological material incorporated therein; wherein the porous latex-



- 27. A method of making a composite biological device, the method comprising depositing at least one latex in a first layer; depositing at least one latex in a second layer on the first layer to form a multilayer microstructure; depositing at least one metabolically active biological material separately or in a combination with at least one latex such that the biological material is incorporated into the microstructure; wherein at least one of the latices forms a nonporous component of the microstructure.
- 28. The method of 27 wherein depositing comprises ink-jet printing with an ink-jet printer.
- 29. The method of 28 wherein the ink-jet printer includes piezo-electric or acoustic pumps.
- 30. The method of claim 27 wherein the second layer is deposited in a pattern.
- A composite biological device for determining the presence of a metal in a sample, the device comprising a biostructure comprising at least one biological material, wherein, upon contact with the metal, the biological material produces a response and emits a signal.
- The device of claim 3 wherein the biostructure comprises biological material immobilized in one or more layers of a polymeric material.
- 33. The device of claim 31 wherein the biological material comprises bacterial cells.
- 34. The device of claim 33 wherein the bacterial cells comprises *E. coli* cells.
- 35. The device of claim 31 wherein the biological material is genetically engineered to produce a response to the metal of interest.
- 36. The device of claim 35 wherein the biological material luminesces upon contact with the metal of interest.
- 37. The device of claim 36 wherein the biological material includes a metal resistant promoter and a reporter gene that encodes luciferase.
- 38. The device of claim 31 which is capable of detecting a metal in an inorganic or organic form.



- 39. The device of claim 31 which is capable of detecting mercury.
- 40. The device of claim 39 which is capable of detecting Hg²⁺ or monamethyl mercury.
- The device of claim 31 further comprising a substrate on which the biostructure is disposed.
- 42. The device of claim 41 wherein the substrate is capable of detecting the signal.
- The device of claim 42 wherein the substrate is a photosensitive film or a light-sensitive electronic chip.
- The device of claim 41 wherein the substrate supports the biological material but does not detect the signal.
- The device of claim 31 which is incorporated into a housing that is capable of penetrating a solid sample.
- 46. The device of claim 45 wherein the sample is mammalian, avian, or fish tissue.
- 47. The device of claim 31 which is capable of quantitatively measuring the amount of a metal in a sample.
- 48. A method of determining the presence of an analyte in a sample, the method comprises contacting the sample with the device of claim 1, wherein, upon contact with the analyte, the biological material produces a response and emits a signal; and detecting the signal.
- A method of determining the presence of an analyte in a sample, the method comprises contacting the sample with the device of claim 31, wherein, upon contact with the analyte, the biological material produces a response and emits a signal; and detecting the signal.